NOTES ON NORTH AMERICAN FLEAS.

By DR. KARL JORDAN.

(With Plates I and II.)

THE types of the species of fleas described by Baker being nearly all in the United States National Museum at Washington, D.C., I went in 1927 to that institute for the purpose of comparing the types and making drawings of such detail as is necessary for the recognition of the species. The following notes and descriptions embody some of the results of that visit.

1. **Ceratophyllus pseudarctomys** Baker (1904).

C. pseudarctomys Baker, *Proc. U.S. Nat. Mus.* xxvii. pp. 387, 399. tab. 24, figs. 1–7 (1904) (New Port, Herkimer Co., N.Y., ♂♂♀ off *Arctomys monax*).

C. acasti Rothschild, *Nov. Zool.* xii. p. 168. tab. 7. figs. 19, 20 (1905) ("Quesnel, B.C.", ♀ off *Sciuropterus sabrinus*).

The single ♀ from which *C. acasti* was described agrees with that sex of *C. pseudarctomys*. The locality of *C. acasti* was said to be Quesnel; but as all our other specimens from British Columbia belong to the next species, while those from Alberta and New York State are *C. pseudarctomys*, there is every reason to suspect an error in locality. The normal hosts of *C. pseudarctomys* seem to be Flying Squirrels.

2. **Ceratophyllus vesperalis** spec. nov. (Pl. I, figs. 1, 2).

Close to *C. pseudarctomys*, but easily distinguished by the tail-ends:

♂. On sternite VII the dense bunch of long bristles found in *C. pseudarctomys* is represented in the new species by a much smaller number of bristles, the segment bearing on each side about 8 to 10 ventral and subventral bristles. Sternite VIII claviform, with some long bristles at the apex. The projection of the clasper which bears the two long acetabular bristles quite short (fig. 1). Exopodite F almost straight, with the anterior and posterior sides nearly parallel from the lower spiniform bristle to the apex; lower spiniform straight, longer than F is broad, above it a short, pointed, spiniform, and at apex a large, almost sabre-shaped spiniform which ends with a thin point. Segments I and II of hind tarsus with some very long and thin apical bristles.

♀. Dorsal portion of apical margin of sternite VII (figs. 2, *a*, *b*) produced as a rounded lobe of variable dimensions, the lobe projecting beyond the rest of the margin. Spermatheca longer than in *C. pseudarctomys*.

Hab. British Columbia: Okanagan and Okanagan Landing, off *Sciuropterus alpinus*; a series collected by J. A. Munro.

3. **Ceratophyllus leucopus** Baker (1904).

♀. *C. leucopus* Baker, l.c. pp. 387, 401 (1904) (Peterborough, N.Y., 1 ♀ off *Peromyscus leucopus*).

♂♀. *C. aeger* Rothschild, l.c. xii. p. 166, no. 10. tab. 6. figs. 5, 7, 9 (1905) (Red Deer, Alberta, ♂♂♀♀ on *Peromyscus arcticus* and *Evotomys saturatus*); Jord., ibid. xxxiv. p. 179 (1928) (*C. aeger* = *C. leucopus*).

Identified from the types of *C. leucopus* and *C. aeger*.

Near *C. wickhami* Baker (1895). In both sexes the first segment of the

maxillary palpus is a little longer than the second, and the proboscis does not reach to the apex of the forecoxa.

Sternite VIII of ♂ distally smooth, gradually pointed and curved upwards, without the apical filamentiferous flap which is present in all the allied species. Common and of wide distribution, from Alberta and Arizona eastward to the Atlantic, probably everywhere in the Middle and Eastern States, on *Peromyscus leucopus*, its normal host.

4. **Ceratophyllus labiatus** Baker (1904).

♀. *C. labiatus* Baker, l.c. pp. 387, 402, tab. 19, figs. 6–9 (1904) (Moscow, Idaho, 1 ♀ on *Lynx canadensis*).

I was not able to identify this flea from the original description and figures. Some of the details given pointed to the neighbourhood of *C. wickhami*, where Baker placed it, but the statement that there were two rows of bristles on the pronotum was against such a position in the genus. I was inclined to assume that Baker made a mistake in assigning two rows to the pronotum, and the type-specimen at Washington shows indeed the pronotum pushed so far into the head that the subapical row of bristles of the head looks as if it belonged to the thorax. The pronotum bears only one row, as in the allied species.

Baker lays some stress on the presence of spiniform bristles on tergite VIII. He says that " the lower lateral portion of the eighth segment bears a number of normal bristles and also about seven short, stout, dark-coloured bristles which are almost spines, in this latter respect differing widely from any nearly related species." The spiniform bristles thus described are placed on the inner surface of the segment, there being 4 on one side of the body and 5 on the other. Such bristles are present in all species of *Ceratophyllus*, and they will be found to be as variable in *C. labiatus* as they are elsewhere.

The relationship of *C. labiatus* is with *C. caedens* Jord. (1925) on the one hand, and *C. nepos* Roths. (1905) on the other. The lobes of sternite VII are nearly as long as in *C. nepos*, and the lower lobe bears a brownish ridge on the inside as in *C. caedens caedens*. As only a single ♀ of *C. labiatus* is known, it is advisable to assume for the present that it represents a species distinct from the others of the *wickhami*-group.

4. **Ceratophyllus caedens durus** subsp. nov. (fig. 3, *a–g*).

Differs particularly in the ♀. Whereas in *C. caedens caedens* Jord. (1925), described from Alberta specimens, sternite VII of the ♀ is divided into a short upper lobe and a broader and somewhat longer lower one, the latter bearing a conspicuous longitudinal, curved ridge on the inner side, the segment is devoid of this ridge in *C. c. durus* and varies from being entire to being divided into two long lobes as illustrated by figs. 3*a–g* (fig. 3*c* from type of *durus*).

In the ♂ the exopodite usually bears 4 spiniforms, rarely 5 on one exopodite and 4 on the other; in *C. c. caedens* there are usually 5 spiniforms, rarely 4 on both exopodites and equally rarely 4 on one and 5 on the other.

Hab. British Columbia: type (♀) from Okanagan, 16.ii.1917, on *Putorius arizonensis*; Blücher Hall, viii.1910, on *Sciurus richardsoni*; Mara Lake, xi.1902, on *Sciurus hudsonius*; Kelowna, viii.1919, on *Mustela*; and from some other localities in British Columbia; all collected by Messrs. Brooks,

Frazer, Gregson, Garrett and Tate. All our British Columbian specimens belong here, and all our numerous Albertan examples are *C. c. caedens*.

5. **Ceratophyllus sexdentatus** Baker (1904).

All the various fleas which I unite here as subspecies of *C. sexdentatus* differ from *C. wickhami* Baker (1895), *C. leucopus* Baker (1904), *C. nepos* Roths. (1905), *C. labiatus* Baker (1904), *C. caedens* Jord. (1925) and *C. latens* Jord. (1925) in the end-segment of the proboscis being shorter than the two preceding segments together, in the median bristle of the occiput being reduced in size and not accompanied by a small bristle (which, in the allied species, is placed obliquely above it), in the hindcoxa bearing 1 to 3 bristles on the inner surface towards the apex, and in the spiniforms of the exopodite being drawn out into a shorter point than in the ♂♂ of the allied species. Normal host: *Neotoma*, but often found on Carnivora preying on *Neotoma*.

(*a*) **C. sexdentatus sexdentatus** Baker (1904).

C. sexdentatus Baker, l.c. xxvii. pp. 387, 403. tab. 24, figs. 8–14 (1904) (Boulder Creek, Cal., on *Neotoma*).

In the ♂ the proximal angle of the anterior lobe of sternite IX is strongly rounded, and the apex of this sternite rotundate-truncate. The exopodite bears from 5 to 7 spiniforms.

In the ♀ sternite VII divided by a deep sinus into a long and narrow upper lobe and a broader lower one, the latter being triangular in lateral aspect.

Hab. Coast Range of California; on *Neotoma*.

(*b*) **C. sexdentatus nevadensis** subsp. nov. (Pl. I, fig. 4).

The ♂ close to *C. s. agilis*, the ♀ not constantly different from *C. s. sexdentatus*.

♂. Anterior lobe of sternite IX ventrally straight, longer than in *C. s. sexdentatus*, the spiniform placed beyond the middle of this lobe and the distal bristle at the curve of the distal margin; the apical lobe of sternite IX nearly evenly rounded at the apex, not rotundate-truncate. Exopodite with 5 spiniforms, sometimes four on one side.

♀. Sinus of sternite VII deep, as a rule extending nearer to the row of bristles than in *C. s. sexdentatus*; upper lobe narrow, sometimes widened at apex.

Hab. California: Pine City, Mono Co., vii. 1922, 3 ♂♂ and 5 ♀♀ on *Mustela arizonensis*, collected by A. B. Howell.

(*c*) **C. sexdentatus agilis** Roths. (1905).

C. agilis Rothschild, *Nov. Zool.* xii. p. 167, no. 11, tab. 7, figs. 16–18 (1905) (Alberta; Brit. Columbia).

♂. Anterior lobe of sternite IX as in *C. s. nevadensis*, but the spiniform more or less median, and the distal bristle at some distance from the curve of the margin. Exopodite with 5 to 7 spiniforms.

♀. Sinus of sternite VII very variable, but rarely as deep as in the two previous subspecies, the lobes variable in width and length, both present in all our specimens.

Hab. British Columbia and Alberta, probably also farther south, on *Neotoma*, accidentally on *Sciurus*, *Ochotona* and *Putorius*. The type-specimen from Banff, off *Neotoma cinerea*.

(*d*) **C. sexdentatus schisintus** subsp. nov. (Pl. 1. fig. 5).

Apparently differs in the ♀ only: the upper lobe of sternite VII broad and short, the lower one absent or quite short. Exopodite of ♂ with 5 or 6 spiniforms.

Hab. Arizona, a series off *Neotoma*, collected by O. C. Duffner; type ♀.

(*e*) **C. sexdentatus pennsylvanicus** Jord. (1928).

Cf. *Nov. Zool.* xxxiv. p. 184. no. 8. text-figs. 8, 9 (1928) (Rolling Rock, Pa., and Potomac, Va.).

Hab. Pennsylvania, Maryland, Virginia, on *Neotoma pennsylvanica*.

6. **Ceratophyllus petiolatus** Baker (1904).

♂. *C. petiolatus* Baker, l.c. pp. 388, 415. tab. 18, figs. 8–11 (1904) (Moscow, Idaho, 1 ♂ off *Lynx canadensis*; not fig. 7, which belongs to *C. idahoensis*).

♂. Sternite VIII differs from that segment of all other species. It is about three times as long as broad, apically rounded (in lateral aspect) and here membraneous, this apical portion being densely studded with minute spicules which point downward; proximally of this membraneous area there is a bristle on each side.

♀. Sternite VII of the ♂ dimorphic; it is either strongly rounded and broad, or is reduced in width from above, the dorsal margin, in the latter case, being almost parallel with the ventral margin, and the apex truncate-subsinuate.

Hab. Idaho and British Columbia; on *Thomomys* and accidentally on *Lynx canadensis*.

7. **Ceratophyllus arizonensis** Baker (1898).

♂. *Pulex arizonensis* Baker, *Journ. N. York Ent. Soc.* vi. p. 55 (1898) (Tucson, Arizona, 1 ♂ off "Silvery Mouse").

♀. *Ceratophyllus proximus* Baker, *Proc. U.S. Nat. Mus.* xxvii. pp. 388, 412. tab. 19. figs. 1–5 (1904) (Palm Springs, "S. Calif." error).

♂. *Ceratophyllus arizonensis* Baker, ibid. pp. 388, 415. tab. 23, fig. 6. tab. 24. figs. 8–12 (1904) (Tucson, on *Neotoma albigula*).

The two names refer to the sexes of the same species. Types compared in U. S. Nat. Mus.

8. **Ceratophyllus arizonensis littoris** subsp. nov. (Pl. I, fig. 6).

♀. Like *C. a. arizonensis*, but the ventral, widened, area of tergite VIII with 21 bristles on one side and 20 on the other, instead of from 14 to 16 as in *C. a. arizonensis*. Sternite VII essentially as in *C. a. arizonensis*, its upper angle a little more turned up, but this difference probably not constant.

Hab. California: S. Diego, 1 ♀ off *Citellus turdicaudatus*, 12.iii.1914, collected by F. Stevens.

9. **Ceratophyllus montanus** Baker (1895).

Pulex montanus Baker, *Canad. Entom.* xxvii. p. 132 (1895) (Colorado, on *Sciurus aberti*).

♂♀. *Ceratophyllus acutus* Baker, *Invertebrata Pacifica*, i. p. 40 (1904) (Stanford University, on *Spermophilus*).

When describing *C. acutus*, Baker compared it with *C. arizonensis* Baker (1898) and *C. idahoensis* Baker (1904), instead of *C. montanus*. The species is widely distributed in the West and individually very variable.

10. **Ceratophyllus labis** J. & R. (1922) (Pl. I, fig. 7).

♂. *C. labis* Jordan & Roths., *Ectoparasites*, i. p. 275. no. 7. text-fig. 267 (1922) (♂, nec ♀; Calgary, off *Putorius* "*longicaudatus*").

The ♀ described by us as that sex of *C. labis* belongs to the new species here following. In the true ♀ of *C. labis* sternite VII is truncate and bears a small, variable, sinus below the upper angle, the chitin being incrassate around the base of the sinus; the segment recalls that of *C. arizonensis*, but in that species the bursa copulatrix is short and upright, whereas in *C. labis* it is long, with the apex curved down. There is, moreover, in *C. labis* and allies (*C. hirsutus*, *C. bruneri*, *C. tuberculatus*, all Baker 1905) at the base of the blind duct of the bursa a sclerification which somewhat resembles the figure 3.

11. **Ceratophyllus rupestris** spec. nov. (Pl. I, figs. 8, 9).

♀. *C. labis* Jord. & Roths., l.c. p. 275. no. 7. text-fig. 268 (1922) (nec ♂; Calgary, from *Putorius* "*longicaudatus*").

Similar to *C. arctomys* Baker (1905), smaller, the bristles on the whole less numerous, the lowest bristle of the posterior row of the abdominal tergite II posterior to the stigma, not directly below it.

♂. Process P. of clasper broader than in *C. arctomys*, the exopodite F broader in upper half, more evenly rounded on the anterior side, the notch of the anterior margin farther upwards than in *C. arctomys*.

♀. Sternite VII slightly and almost evenly incurved, the upper angle often much less rounded than in our figure. Spermatheca much smaller than in *C. arctomys*.

Hab. Alberta: Calgary (type), a large series off *Putorius longicauda* and *Spermophilus richardsoni*, collected by Messrs. G. F. Dippie and C. Garnett; also from Blackfalls, off *Thomomys* and *Canis* (A. D. Gregson), and Dorothy, off *Thomomys* (W. G. Hodgson). *Spermophilus* probably the true host. *C. arctomys* also occurs in Alberta, on *Marmota*.

12. **Ceratophyllus idahoensis** Baker (1904).

♂♀. *C. idahoensis* Baker, *Proc. U.S. Nat. Mus.* xxvii. pp. 388, 413, tab. 18, figs. 1–7 (1904) (Moscow, Idaho, on *Citellus columbianus*; figs. "1–6" laps. cal.).

♂♀. *C. poeantis* Rothschild, *Nov. Zool.* xii. p. 155. no. 2. tab. 8, figs. 22, 23 (1905) (Alberta, British Columbia and Arizona, off *Tamias*, *Spermophilus*, *Sciurus*, *Putorius* and *Marmota*; "Pl. VII" laps. cal.).

Some statements in Baker's description misled N. C. Rothschild to create a synonym. The frontal tubercle is said to be absent in *C. idahoensis*, which is erroneous, and it is stated of the abdomen that the first two tergites bear small apical teeth, while in reality tergites I to IV, sometimes even I to V bear such teeth.

13. **Ceratophyllus ignotus ignotus** Baker (1895).

♀. *Pulex ignotus* Baker, *Canad. Entom.* xxvii. pp. 110, 112 (1895) (Ames, Iowa, host not given).

♂. *Typhlopsylla americana* Baker, l.c. pp. 189, 199 (1895) (partim; Ames, Iowa, on *Geomys bursarius*).

In the N. C. Rothschild collection there is from the Baker collection a ♂ which bears the note on Baker's label: "This was the type of *P. ignotus*." The statement is erroneous, the species having been described by Baker from 2 ♀♀. I have examined these two specimens in the U.S. Nat. Mus.; both slides bear

the remark: "This was the type of *P. ignotus.*" One of them I have selected as type and labelled it as such, the second specimen, the paratype, has been transferred to Tring. As regards *Typhlopsylla americana*, the above-mentioned ♂ in coll. N. C. R. was selected by us as type in *Ectoparasites*, i, p. 55 (1915). There is in the U.S. Nat. Mus. a second Iowa ♂, likewise labelled type by Baker. This specimen is in good order; its clasper and exopodite are nearly the same as in *C. ignotus franciscanus* Roths. (1910) and the eighth abdominal sternite agrees with our figure in *Ectoparasites*, text-fig. 57. The seventh sternite of the ♀ is deeply incurved, not truncate. These details will be figured in the Monograph. A ♀ in the coll. of the Agricultural Dept. at Cornell is named *americana* by Baker and also labelled type by him; it came Ames, Iowa, off *Geomys bursarius*, ix. 88.

14. **Ceratophyllus fasciatus** Bosc (1801).

Pulex fasciatus Bosc, *Bull. Soc. Philom.* iii. 44, p. 156 (1801) (*Myoxus nitela*).

♀. *Ceratophyllus californicus* Baker. *Proc. U.S. Nat. Mus.* xxvii. pp. 387, 395, tab. 17. figs. 5–8 (1904) (Mountain View, Calif., 1 ♀ on *Microtus californicus*).

♂. *Ceratophyllus oculatus* Baker, l.c. pp. 387, 396, tab. 19. figs. 10–14 (1904) (Washington, D.C., 1 ♂ on *Putorius vison*).

♀. *Ceratophyllus canadensis* Baker, l.c. pp. 388, 407, tab. 20. figs. 1–4 (1904) (Ottawa, Canada, 1 ♀, host not known).

The types of the three Bakerian names are in U.S. Nat. Mus., where I have compared them. The specimens undoubtedly belong to *C. fasciatus.*

15. **Ceratophyllus asio** Baker (1904) (Pl. I, figs. 10, 11).

♀. *C. asio* Baker, l.c. xxvii. pp. 388, 406 (1904) (Wellesley, Mass., 1 ♀ on *Megascops asio*).

This is a mouse-flea. Besides the type there is a second specimen in the U.S. Nat. Mus., also a ♀, and the collection of the Entomological Department of Cornell University contains a ♂ and several ♀♀ obtained on a field-mouse at Ithaca.

The species is allied to *C. querini* Roths. (1905), *C. walkeri* Roths. (1903), *C. acerbus* Jord. (1925), etc. We figure the exopodite of ♂ and the outline of VII. st. of ♀.

16. **Ceratophyllus megacolpus** spec. nov. (Pl. I, fig. 12).

♀. Similar to *C. asio* Baker (1904), but VII.st. so deeply sinuate that the row of long bristles is nearer the apex of the sinus than in *C. asio.* Pronotum as in *C. asio* with two rows of bristles. Bursa copulatrix with a long glandular continuation from which emanates the duct of the spermatheca.

Hab. British Columbia: Okanagan Landing, 1 ♀ off *Microtus drummondi*, ix.1912 (E. A. Chapin), in U.S. Nat. Mus.

17. **Ceratophyllus immitis** spec. nov. (Pl. I, fig. 13).

♀. Nearest to *C. acerbus* Jord. (1925); the end-segment of the proboscis as in that species a little longer than the end-segment of the maxillary palpus. Sinus of VII.st. much shallower, the lower lobe hardly at all projecting. Below the stigma of VIII.t. 5 to 8 bristles, of which 3 are long; farther down 21 to 24. Duct of spermatheca for the greater part rather strongly chitinised and therefore conspicuous, being similar to the duct of *S. abantis* Roths. (1905)

and *S. querini* Roths. (1905). In all these species as well as No. 14 and a number of others, the stigma-cavity of VIII.t. is very large.

Hab. Canada : lat. 48045, vi.1846, from Lemming, probably *Dicrostonyx hudsonius*.

18. **Ceratophyllus eumolpi cyrturus** subsp. nov. (Pl. I, fig. 14).

♂♀. As in *C. e. eumolpi* Roths. (1905), segments I and II of the ♂-midtarsus with long thin bristles and the exopodite with three blunt spiniforms, of which the upper two are short, the lowest long ; in ♀ the bursa copulatrix broad and spirally rolled up.

♂. Process P of clasper and exopodite broader than in *C. e. eumolpi*, the second spiniform much nearer to the long one than to the short subapical spiniform ; apical margin of exopodite much less slanting. Apex of ventral arm of IX.st. (fig. 12) produced into a long nose, which is curved down.

♀. The lobe of VII.st less rounded than in *C. e. eumolpi*, its lower angle usually distinct ; spermatheca longer.

Hab. Arizona : Paradise, 1 ♂ and 5 ♀♀ off *Mephitis*, x.1913 (O. C. Duffner).

19. **Ceratophyllus ciliatus** Baker (1904).

The exopodite of this species is long, apically dilated postiead and bears on this apieal projeetion two short obtuse spiniforms ; the ventral arm of IX.st has no membraneous apical flap. Head of spermatheca almost globular, much shorter than the tail. VII.st. of ♀ deeply sinuate, inerassate around the apex of the sinus. The surfaee ridges of the basal abdominal sternite of the ♀ are much more strongly curved baekwards in the middle of the segment than in any other allied speeies.

Three subspeeies are known to me :

(*a*) **C. ciliatus ciliatus** Baker (1904).

♂♀. *C. ciliatus* Baker, *Proc. U.S. Nat. Mus.* xxvii. pp. 387, 397, tab. 16, fig. 1-6 (1904) (Mountain View, Calif., on Chipmunk).

I have seen only the pair from which the species was described by Baker. In the ♂ proeess P of the clasper is broader than in the other two subspeeies, and the apex of the exopodite less dilated postiead. In this ♂ the lower subapical spiniform of the left exopodite is prolonged, being about thriee as long as the upper spiniform, and its extreme tip is bent down, forming a short hook ; the spiniforms of the right exopodite are normal.

The upper lobe of VII.st. of the ♀ is evenly rounded and broad, but less broad than the lower lobe, whieh is truncate with the upper angle rounded off ; the sinus a narrow sharp ineision.

Hab. California : Mountain View, Santa Cruz Co., on *Eutamias townsendi* ; one pair in U.S. Nat. Mus., type ♂, paratype ♀, by my seleetion.

(*b*) **C. ciliatus protinus** subsp. nov. (Pl. I, figs. 15, 16).

♂. The proeess P of the clasper narrower than in *C. c. ciliatus*, and the apex of the exopodite, though variable, always strongly dilated postiead.

♀. Upper lobe of VII.st. more or less triangular and pointed.

Hab. British Columbia : a series from various plaees, type from Sumas, off *Eutamias townsendi*, collected by Allan Brooks ; oeeurs also on *Sciurus hudsonius*.

(*c*) **C. c. mononis** subsp. nov. (Pl. 1, figs. 17, 18).

♂. Process P of clasper shorter and narrower than in both previous subspecies ; exopodite as much widened at apex as in *C. c. protinus*, but the angle of the anterior margin lower down, being placed below the middle.

♀. Upper lobe of VII.st. very much broader than the lower lobe, its apex rounded and the oblique lower margin once feebly incurved ; the lower lobe subtriangular in lateral aspect, its dorsal margin rounded.

Hab. California : Pine City, Mono Co., 1 ♂ and 2 ♀♀ off *Mustela arizonensis* and *Eutamias frater*, vii.1922 (A. B. Howell).

20. **Ceratophyllus vison** Baker (1904).

♂♀. *C. vison* Baker, l.c. pp. 388, 408 (1904) (Peterborough, N.Y., on *Putorius vison*).

♂♀. *C. lucidus* Baker, l.c. pp. 388, 410, tab. 20, figs. 5–9 (1904) (Pagosa Park, Colorado, on *Sciurus fremonti*).

Baker mentions, in his keys and descriptions, certain differences between *C. vison* and *C. lucidus* ; but an examination of the types and a series of paratypes proves the differences partly to be unreliable and partly to be due to errors of observation. We have the species also from Alberta and British Columbia.

21. **Ceratophyllus wagneri** Baker (1904).

A most interesting object for the study of geographical variation. In some of the various subspecies the ♀♀ exhibit greater differences than do the ♂♂. The spermatheca is unique in its long subcylindrical head being narrower than the tail, the organ recalling a snake or certain Sipunculid worms, such as *Aspidosiphora* and *Phascolosoma*. The species is restricted to the west of the Continent, not being known farther east than New Mexico, Wyoming and Alberta.

(*a*) **C. wagneri wagneri** Baker (1905).

♂. *C. wagneri* Baker, l.c. pp. 387, 405, tab. 15, figs. 3–7 (1905) (Moscow, Idaho, 2 ♂♂ on *Peromyscus leucopus* and *Mus musculus*).

The specimens from British Columbia, Idaho and Wyoming belong to one subspecies. The spermatheca is vermiform, the apex of its head not being swollen. The duct of the bursa copulatrix is distinctly sclerified for a considerable distance ; this conspicuous portion of the duct, which resembles a capital S, is about as long as the swollen tail of the spermatheca, being longer than the non-sclerified lower portion of the duct of the bursa. VII.st. of ♀ often with small sinus.

Hab. British Columbia ; Idaho ; Wyoming ; Western Montana ; on *Peromyscus*, accidentally on other mice.

(*b*) **C. wagneri systaltus** subsp. nov. (Pl. II, fig. 19).

♂. Exopodite somewhat narrower than in the previous subspecies, and its anterior margin more incurved.

♀. Duct of bursa copulatrix much shorter than in *C. w. wagneri*, the sclerified portion of it about as long as the tail of the spermatheca is broad. Head of spermatheca vermiform as in the previous subspecies.

Hab. Alberta : Blackfalls, on mouse (probably *Peromyscus*), type (A. D. Gregson) ; Red Deer, on *Peromyscus arcticus*, v.1901 (F. G. Dippie) ; a series.

(*c*) **C. wagneri ophidius** subsp. nov. (Pl. II, fig. 20).

♂. Exopodite on the whole broader than in the two previous subspecies, and reaching well above process P of the clasper.

♀. Apex of head of spermatheca swollen, the organ recalling a snake. The sclerified portion of the bursa copulatrix about as long as in *C. w. wagneri*.

Hab. California, coast district : S. Francisco, type (Carroll Fox) ; San Mateo (M. B. Mitzmain) ; a series from *Putorius xanthogenys* (probably accidental host).

22. **Ceratophyllus thambus** spec. nov. (Pl. II, fig. 21).

♂. Closely allied to *C. wagneri* Baker (1904), but the levers of the genital armature not rolled up in a spiral, being very much shorter than in *C. wagneri*, the longest lever only forming half a convolution, and the lamina of the penis being without a long wire-like lever. Sternite VIII about half as long as in *C. wagneri*, without apical membraneous flap. Process P of clasper much longer and extending a little above the exopodite. The latter less dilated below middle and gradually rounded-oblique at apex on posterior side, gradually narrowing, forming a sharp apical angle on anterior side ; three spiniforms as in *C. wagneri*, but the lowest longer and thinner than in *C. wagneri*, and the other two ending with a very thin point. Distal lobe of ventral arm of IX.st. pointed, with the apex curved upwards, not downwards (fig. 21). Apex of paramere obtuse, thumb-like, its ventral apical margin being rounded and its dorsal apical margin slightly incurved.

Hab. Alberta : Red Deer (A. D. Gregson), 1 ♂ off *Lynx* ; the true host probably a mouse.

23. **Ceratophyllus bitterootensis** Dunn & Parker (1923).

♂. *C. bitterootensis* Dunn & Parker, *Public Health Reports*, xxxviii. p. 2771 (Reprint p. 11) (1923) (W. of Darby, Montana, on *Neotoma*).

♂♀. *C. isus* Jordan, *Nov. Zool.* xxxii. p. 110. no. 34. text-figs. 39, 40 (1925) (Red Deer R., Canad. Rocky Mts., on *Mus*).

The description of *C. bitterootensis* was taken from 2 ♂♂, one of which, the paratype, I have had an opportunity to compare with *C. isus*, with which it agrees.

24. **Ceratophyllus penicilliger** Grube (1852).

Two ♂♂ obtained by A. H. Twitchell at Flat, Alaska, on *Microtus* in March 1925, are the first Nearctic specimens I have seen of this widely distributed Palaearctic species. The specimens are badly preserved, having been treated with too strong a dose of KOH, but the characteristic genital armature renders the identification certain. The better specimen in U.S. Nat. Mus., the second at Tring.

25. **Ceratophyllus stejnegeri** spec. nov. (Pl. II, figs. 22, 23).

♂♀. Related to *C. araucanus* J. & R. (1920) from Chile. The proboscis shorter, the pronotum with a comb of 40 spines (♂) or 36 (♀), which are narrower than in *C. araucanus* ; the small bristles on meso- and metanotum and on the first abdominal tergite more numerous, there being two complete rows in front of the postmedian row of long ones, besides some additional dorsal bristles.

♂. Process P of clasper broad and apically round ; three acetabular bristles. Exopodite straight from near base, subconical, with two stout pointed spiniforms at lower angle and another below middle, all three somewhat longer than the

exopodite is broad in middle. Ventral arm of IX. st. with a rounded proximal lobe, which bears a marginal row of 6 or 7 rather strong pale bristles and on the distal portion of inner side a stouter submarginal one ; apical lobe of ventral arm gradually dilated, the apex dorsally and distally rounded, ventrally incurved, the ventral apical angle somewhat projecting downward. Sternite VIII narrow, without long bristles or spiniforms, but on each side with an irregular row of minute hairs ; at apex of sternite VIII a large flap directed obliquely distad, the proximal portion of its anterior margin smooth and rather strongly chitinised, the rest of the flap being membraneous and bearing numerous filaments.

♀. Upper and lower antepygidial bristles about as long as the bristles of the posterior row of tergite VII ; sternite VII sinuate below upper margin, the upper lobe short, sharply pointed, the lower lobe broad and long. Head of spermatheca little longer than broad, almost globular (dorsally split across in the only ♀ seen), similar to that of *C. araucanus*, as is also the bursa copulatrix. Anal sternite longer, and its ventral margin straighter than in *C. araucanus*, with a larger number of small short bristles.

Hab. Bering I., Commander Is., 1882–3 (L. Stejneger), one pair, host not mentioned ; in U.S. Nat. Mus. Named in honour of the collector. This northern bird-flea is a most interesting discovery, as the affinities of the species are with species known from Chile, Argentina and Brazil.

26. **Ceratophyllus celsus apricus** subsp. nov. (Pl. II, fig. 24).

♂. Process P of clasper subacuminate, not truncate, the posterior margin of the clasper between the acetabular bristles and base of P distinctly convex ; (left exopodite with three long bristles, right clasper with two) ; vertical arm of sternite IX more strongly dilated below middle, but its apical nose shorter, than in *C. c. celsus* Jord. (1926). Sternite VIII with a sharply pointed apical transparent process which points upwards (the position of this projection proves that in the type of *C. c. celsus* both the right and left projections are accidentally twisted at the base and in consequence of this twist directed distad instead of upward) ; a bunch of 6 apical bristles as in *C. c. celsus*, but 2 of them slightly shorter and a little more spiniform than the others (all broken away in the paratype).

♀. Apparently not different from *C. c. celsus*.

Hab. Cuba : Soledad, in nests of *Petrochelidon fulva*, collected by J. Bequaert ; 2 pairs, more or less strongly damaged, type (♂) and paratype (♀) in U.S. Nat. Mus., the second pair in coll. N.C.R.

27. **Ceratophyllus niger inflexus** subsp. nov. (Pl. II, fig. 25).

♀. Only two specimens known. Both have the apical margin of sternite VII incurved above middle.

Hab. Colorado : Custer Co. (T. D. A. Cockerell), no host mentioned, 1 ♀, type, in U.S. Nat. Mus. ; Colorado Springs, 1 ♀ on *Eutamias*, xi.1909 (E. R. Warren), in coll. N. C. R.

Dactylopsylla gen. nov.

♂♀. Similar to the *ignotus*-group of *Ceratophyllus*, but more specialised. Eye vestigial. Hindtibia with about 20 dorsal bristles. Hindtarsal segment V shorter than III.

♂. Exopodite very long and slender, curved backwards at apex. Proximal setiferous lobe of sternite IX separated by a broad sinus from the distal lobe,

no hinge between the two lobes, ventral angle of distal lobe hook-shaped, not rounded. Dorsal portion of outer sheath of penis modified into a long, narrow, finger-like process which is curved down and is not pointed, and the lateral portion of the sheath ending with a sharp hook directed down and placed above a sinus of the sheath.

♀. Below eye a long marginal bristles, in addition to the usual eye-row of three. Stylet at least thrice as long as broad. Head of spermatheca longer than broad, orifice subventral or ventral.

Genotype: *Odontopsylla bluei* Fox (1909).

28. **Dactylopsylla comis** spec. nov. (Pl. II, fig. 26).

♀. Apical margin of sternite VII rounded, not produced into a narrow triangular lateral lobe as in *D. bluei*.

On mesopleura 13 or 14 long bristles and anteriorly nearly 30 small ones. On metanotum about 33 bristles in front of the postmedian row, on the two sides together. Bristles on abdominal tergites also more numerous than in *D. bluei*: tergites II 38, 33; III 39, 35; VI 27, 29; VII, 24, 24; on the two sides together. On sternite II 22 on the right side and 24 on the left (long and short), on sternite VII 54 on both sides together. Anterior coxa with more than 80 bristles. On outside of hindtibia 23 or 24 lateral ones. The longest apical bristle of hindtarsal segment II reaches to apex of IV, not beyond it. Sternite VII broadly rounded. Stylet more than four times as long as broad. Head of spermatheca shorter than in *D. bluei*.

Hab. British Columbia: Okanagan Landing, 1 ♀ off *Thomomys fuscus*, collected by J. A. Muro.

29. **Phalacropsylla arachis** spec. nov. (Pl. II, fig. 27).

♂♀. Proboscis reaching to two-thirds of forecoxa. Abdomen without apical spines. Pygidium not convex behind. Hindcoxa with one row of short, but rather stout, spiniforms. Hindtarsal segment III shorter than V, and IV at most one-third longer than broad. Chaetotaxy essentially as in *Ph. cummingi*, but the bristles of the hindleg on the whole a little shorter.

♂. Genital armature similar to that of *Ph. cummingi* Fox (1926), but the bristles of sternite VIII more distal; clasper with fewer bristles; exopodite narrower, without any bristles in lower two-fifths; apex of sternite IX more pointed and the two spiniforms nearer the point.

♀. Apical margin of sternite VII slanting, somewhat undulate, with a shallow bay at some distance above the ventral angle, which is rounded off; apex of tergite VIII pointed. Head of spermatheca as broad anteriorly as posteriorly, but thinner in middle. Ventral margin of anal sternite subangulate.

Hab. Arizona: McCleary's Ranch, 30 miles S.E. of Tucson, 30.i.1921 (V. Bailey), on *Dipodomys spectabilis*, 1 ♂ and 4 ♀♀, and 1 ♀ on *D. merriami* ex coll. Chapin in U.S. Nat. Mus. (2 ♀♀ transferred to the N. C. R. collection); type ♂.

30. **Phalacropsylla shannoni** spec. nov. (Pl. II, figs. 28, 29).

♂♀. Agrees with *Ph. arachis* in the shortness of the proboscis, the absence of apical spines from the abdominal tergites, the flatness of the pygidium and the row of spiniforms on the inside of the hindcoxa; but segments II of midtarsus and III of hindtarsus a little longer than V, and IV of hindtarsus nearly twice

as long as broad. Bristles of hindtibia and hindtarsus very long. Only 2 antepygidial bristles, one long, the other nearly as stout, but only one-fourth as long.

♂. Sternite VIII with a curved subapical row of bristles nearly parallel to the rounded apical margin. Clasper almost gradually narrowed into a conical process, with two very long and numerous shorter bristles. Exopodite nearly as in *Ph. cummingi* Fox (1926), but somewhat shorter, with the bristles in lower half more numerous. Sternite IX quite different : ventral arm divided into four processes (two on each side), the outer process of each side is without bristles and recalls a hoe ; the inner process also is widened downward at the apex ; its upper angle slightly acute, bearing a pale bristle, below which, at the vertical apical margin, a small, pale, curved spiniform ; the ventral nose of the inner process rounded, bearing a short, stout, obtuse spiniform at the apex and proximally to this two short stout bristles.

♀. Apical margin of sternite VII nearly vertical, its upper angle rounded and slightly projecting. Apex of tergite VIII rounded off. Head of spermatheca inverted pyriform, broadest towards tail. Ventral margin of sternite X straight, the bristles thinner than in *Ph. cummingi*.

Hab. Washington : Ritzville, vi.1920, on fieldmice (R. C. Shannon), 3 ♂♂ and 1 ♀, type ♂ in U.S. Nat. Mus., one paratype ♂ transferred to coll. N. C. R. ; Lind, viii.1920, off fieldmouse (R. C. Shannon), 3 ♂♂ ,1 ♀ ; from same place, off *Perognathus*, and " Big-eared mice," x.1920 (M. C. Lane), a small series in coll. of Ent. Department, Cornell, Ithaca.

31. **Nycteridopsylla chapini** spec. nov. (Pl. II, figs. 30, 31).

♂♀. The apical spines of abdominal tergites I and II as short as those of the metathoracic comb, and there are at most 5 spines in these combs, whereas the pronotal comb contains from 29 to 32 spines. Segment II of maxillary palpus twice, in ♂ less than twice, the length of segment I. The four subdorsal bristles on the frons of the ♀ very stout, almost spiniform, much stouter than any bristles of the abdomen ; in ♂ 3 bristles, which are not enlarged, being about as thick as the lateral bristles placed below the row of three. The bristles of the occiput as stout in ♀ as the subdorsal ones of the frons, in ♂ on the whole slightly stouter than the bristles of the pronotum.

♂. Clasper almost equally divided by a broad apical sinus into a dorsal and a ventral process, the ventral process bearing a long stout bristle. The exopodite similarly forked, but the processes longer than those of the clasper, the dorsal one narrow, subcylindrical, truncate, and the ventral process, which is the longer of the two, slightly widened towards apex and bearing a marginal, apical row of 5 or 6 long bristles, besides a few small marginal and lateral ones. The distal lobe of sternite IX very long, curved upwards from close to its origin, widest in middle, rounded at apex, nearly five times as long as broad (the length measured in a straight line).

♀. Apical margin of sternite VII rounded, without a distinct lateral sinus ; the segment bears a row of 9 bristles, in front of which there are 7 small bristles, on the two sides together. Stylet slender, as long as the third hindtarsal segment.

Length (approximately), ♂ 1·7 mm., ♀ 2·6 mm. ; hindfemur ♂ 0·38, ♀ 0·43 mm.

Hab. Maryland : Glen Echo, on *Eptesicus fuscus*, iii.1916 (R. O. Shannon), 2 pairs ex coll. E. A. Chapin, in whose honour the interesting species is named ; one pair transferred to coll. N. C. R. ; type ♂ in U.S. Nat. Mus.